

Tytler's Leaf Warbler *Phylloscopus tytleri*: non-breeding distribution, morphological discrimination, and ageing

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A review of specimens of Tytler's Leaf Warbler *Phylloscopus tytleri* taken outside the breeding season established that the species is a regular fall transient through the Himalayas of Himachal Pradesh, wintering in the Western Ghats and Nilgiris. The route taken in spring appears to be somewhat more easterly, with scattered records both to the north and south of the Satpura Range and in the Himalayas of Uttar Pradesh and Nepal. In addition, a re-examination of the evidence of breeding east of the known range shows it to be suggestive but inconclusive. A *P. tytleri* specimen purported to have been taken in the Uttar Pradesh Himalayas in November by Meinertzhagen is almost certainly a missing late September or early October specimen collected in Simla by Davison. The only specimen record of the species from Orissa was found to be a misidentified Greenish Warbler *P. trochiloides*. Specimen-based identification criteria are summarized, and it is shown that lengths of the nasal groove and rictal bristles are diagnostic of *P. tytleri*. Ageing of specimens based on a combination of rectrix shape and cranial and tarsal ossification visualized in x-rays shows that first-winter birds and fresh fall adults are not distinguishable in the field. During spring but not at other seasons, *P. tytleri* often has reddish, tiny-grained pollen adhering to the feathers of its forehead.

INTRODUCTION

Tytler's Leaf Warbler *Phylloscopus tytleri* Brooks 1871 is a small, drab, near-threatened (Collar *et al.* 1994) warbler that breeds only in a very limited area of the Western Himalayas from north-eastern Afghanistan (Paludan 1959) east at least through Kashmir (Ali and Ripley 1983). Although adults of *P. tytleri* possess distinctively shaped bills (Plate 1), this is often not obvious and the species poses significant identification problems, as evidenced by the frequency of documentable misidentifications (detailed below). At all seasons it occurs alongside several more abundant congeners, and although on its breeding grounds *P. tytleri* is locally common and has been relatively well studied (Price and Jamdar 1990, Price 1991, Richman and Price 1992, Marchetti *et al.* 1995), its migratory and wintering range remains poorly documented owing to the wide dispersal of what must be a relatively small world population and the difficulty of certain identification. The purpose of this paper is to summarize critically evaluated specimen records of this near-endemic, little-known species's occurrence primarily outside its known breeding range, and to clarify its identification and ageing to facilitate future study of its distribution and biology.

METHODS

Specimens examined

During the course of this study I examined nearly all known specimens of *P. tytleri*, as well as series of similar congeners at the American Museum of Natural History (AMNH), Academy of Natural Sciences of Philadelphia, The Natural History Museum (BMNH), Bombay

Natural History Society (BNHS), Carnegie Museum of Natural History, Field Museum of Natural History (FMNH), Los Angeles County Museum (LACM), Michigan State University Museum (MSU), Museum of Comparative Zoology (MCZ), National Museum of Natural History (USNM), Yale Peabody Museum, University of Michigan Museum of Zoology (UMMZ), and Zoological Survey of India, without finding additional misidentified non-breeding specimens of *Phylloscopus tytleri* beyond those mentioned below. Computer catalogues examined for all other North American museums with significant holdings of Indian bird specimens list no additional specimens of this species.

Measurements

'Culmen (ff)' was measured from the distal edge of feathers; 'culmen (fs)' from skull; 'wing' is maximum length (flattened and straightened); 'tail' is from insertion point between central rectrices; 'tail/wing ratio' is given as in Ticehurst (1938). 'Nasal groove' is from the distal edge of the feathering to the distal end of the groove in which the nostril is located; 'rictal bristle' is the length of the longest bristle found on either side; 'bill depth' is the depth of the upper mandible at the edge of the feathering. All measurements were taken by the author except those of one AMNH specimen taken by M. LeCroy and one UMMZ specimen by J. Hinshaw. Original measurements are available from the author upon request.

Ageing

To determine whether first autumn *P. tytleri* can be distinguished from fresh-plumaged fall adults, I examined shape of rectrices, presence of growth bars,

and radiographs (x-rays) for degrees of skull and tarsal ossification. X-rays taken by the author included ventral, lateral, and ventrolateral views of 16 specimens from North American museums in the laboratory of the Division of Fishes, National Museum of Natural History (NMNH), using Kodak Industrex-M and SR film, at 25 and 30 kV and 5 mA for 30 sec; x-rays of 19 BMNH specimens were made by R. P. Prÿs-Jones and PCR using a Solus-Schall at 30 kV and 10 mA for an exposure of 40 sec, in the laboratory of the Lower Vertebrate Curation Group, Department of Zoology, The Natural History Museum, BMNH. Specimens were compared on the same x-rays to avoid differing effects due to varying exposures and developing protocols. The opacity and/or granularity caused by preservative and various stuffing materials on the appearance of the skull in x-rays of some specimens was distinguished from indicators of ossification, and no age determination was made in a few cases in which it proved impossible to confidently visualize skull pneumatization.

Specimen authentication

I attempted to determine the likelihood of authenticity of three *P. tyleri* specimens of questionable provenance, two of which potentially form significant records of this species, by comparing the specimens with those of other series in external appearance and by examination of x-rays. First, doubt was cast upon the validity of data accompanying a specimen (BMNH 1965.M.14256) purported to have been collected in early November at about 2,300m in the Himalayas of Uttar Pradesh by Richard Meinertzhagen, based on recent findings of widespread specimen fraud in the Meinertzhagen Collection (Knox 1994, B.O.U. 1997, Rasmussen and Collar in press, Rasmussen and Prÿs-Jones in prep.). To determine whether the label data could be genuine I compared Meinertzhagen's specimen in detail with those it most closely resembled in the BMNH collection: series by H. Whistler, A. E. Jones, and W. Davison. The specimen registers for these collections at the BMNH as well as that for the Jones acquisition at the BNHS were examined for the possible listing of specimens missing from the collections. Another Meinertzhagen specimen at the Berlin Museum was compared with the above for external preparation style.

The third problematical specimen (ROM 66799) bears the label annotation: [Mahabaleshwar...], 'Locality deduced, see collector's nos. 1-24 of this lot'; this specimen was thus compared both externally and on x-ray with two BMNH *P. tyleri* specimens collected at Mahabaleshwar by Fairbank, and with seven specimens of other passerine taxa from Mahabaleshwar and nearby Sirur from the collection of S. A. Winsor, and now in the Field Museum of Natural History (FMNH), to evaluate possible style similarities. X-rays for the Winsor specimens were done by K. Swagel at the FMNH.

Pollen

The presence or absence of reddish pollen on the feathers of the head was noted for each *P. tyleri* specimen examined. Occasionally it was difficult to distinguish between bloodstained feathers and pollen, and this was noted in such cases. Usually, however, the pollen was readily seen as a reddish sticky substance on the forehead and sometimes the chin, often partially glueing the

feathers together. This was verified to be pollen by J. Kress, Department of Botany, National Museum of Natural History, who examined the pollen *in situ* on detached feathers of USNM 536237 under light and scanning microscopes.

BREEDING DISTRIBUTION OF *P. TYTLERI*

The known breeding range of *P. tyleri* encompasses a small, presumably relictual (Martens 1980) area in the Western Himalayas (Figure 1), including Nuristan, extreme north-east Afghanistan (Paludan 1959; specimen from the Zoologisk Museum, University of Copenhagen, ZMUC 1.12.1951.1195, reexamined for this study); Kaghan Valley, N.W.F.P. (an uncatalogued egg set in BMNH) (Whitehead 1914); north to Gilgit (Biddulph 1881, 1882); and east through Kashmir (Richmond 1895, Bates and Lowther 1952, Brooks 1872b, Davidson 1898, Osmaston 1923, 1926, 1927 and 1930, Price and Jamdar 1990) to the Zoji La Pass (Stoliczka 1874), Baltal, and Kargil, western Ladakh (Sharpe 1891, Vaurie 1972). There are numerous sight reports, although no specimens were traced, of the species in summer from much of the intervening area between Nuristan and Gilgit and Kaghan Valley, but none yet from Chitral (Roberts 1992).

Statements that *P. tyleri* breeds in Uttar Pradesh east to Garhwal or Kumaon (Hartert 1910, Baker 1924 and 1933, Jones 1948) have long been discounted, as their basis was unknown to Ticehurst (1938), and subsequent ornithological work in those regions has failed to substantiate the claims. However, an egg set attributed to this species from Garhwal in the BMNH collections must certainly be the basis for the assertions, and the collector of the egg set (S. L. Whymper) seems to have been reliable (M. P. Walters verbally 1996). The eggs, collected on 27 June 1907, are pure white and the measurements are consistent with those of *P. tyleri*. Baker's accompanying card reads 'Taken by S. L. Whymper and sold to me with the rest of his collection. Data copied from top of chip box in which the eggs were packed.' However, the fact that Whymper himself apparently did not publish upon these eggs in his several subsequent papers on the breeding of birds in Garhwal (Whymper 1907, 1910, 1911, 1915) in which a number of species of *Phylloscopus* are featured, suggests uncertainty as to the provenance and/or identity of the eggs. The locality of the only *P. tyleri* egg set from Kishtwar in the BMNH (also unregistered) may also be questionable, as the label bears the annotation 'I think these were taken in our expedition to Ladak, I could probably tell by Spec. 484 when I get back to town'. Because of previously documented problems with the Baker Collection (Harrison 1966, Harrison and Parker 1966a and b, 1967, Parker 1970), Baker's nidification records can only stand when corroborated by more reliable records.

A previously unpublished specimen in very worn plumage (Field Museum of Natural History, FMNH 241166) was collected by W. N. Koelz on 4 July 1936 at Kukti, Chamba District, western Himachal Pradesh. However, fledging has been recorded on 19 July (Price and Jamdar 1990), and juveniles have been collected

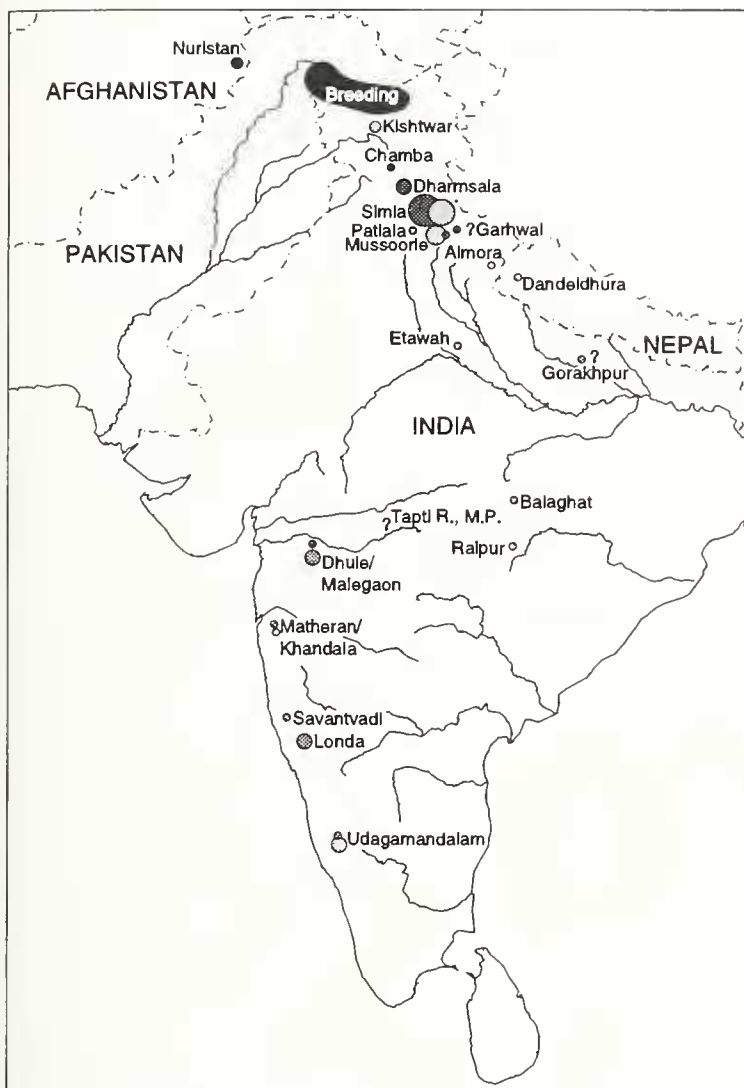


Figure 1. Map of localities from which specimens of *P. tytleri* are known. Specimens from the main portion of the breeding range are not mapped individually. Specimens from Keonthal and Koti State are included with Simla. Circle size is roughly proportional to the number of specimens available from each locality; black-filled shapes are specimens from the summer months (June–August); dark grey-shaded circles from autumn (September–November); medium grey-shaded circles from winter (December–February); and light grey circles from spring (March–May). Full data from each specimen available in Table 1.

on 2 and 4 August (Kashmir); 9 August (Gilgit), and 11 August (Sonamarg). In late summer, *P. tytleri* remains on or near its breeding grounds, often in family parties above the timberline (T. D. Price *in litt.* 1996). Some remain well into September (Gulmarg, 13 September, BMNH 1926.7.1.138; Palgahm, 20 September, MCZ 149572), where they undergo a complete moult before migration (Williamson 1962). Thus, 4 July seems unusually early for a bird, especially one which has not yet moulted, to be far from its breeding grounds, and though it remains to be proven, the FMNH specimen suggests that *P. tytleri* may breed in Chamba District of Himachal Pradesh, to the south-east of its definitely known breeding range. The species was not found in summer around Manali, just to the east of Chamba, despite two summer's field work on *Phylloscopus* species there (T. D. Price *in litt.* 1996).

Price and Jamdar (1992) have previously shown that Alexander's (1950) discussion of the Plain Leaf Warbler *P. neglectus* in Kashmir actually refers to *P. tytleri*. In

addition, the same should be said for the discussion of *P. neglectus* in Alexander (1969), and thus observations referred by him to *P. 'tytleri'* in Kashmir most likely refer to yet another species of *Phylloscopus*.

RANGE IN MIGRATION

P. tytleri has not been recorded in the plains of Pakistan (Ticehurst 1926, Roberts 1992) or the arid regions of north-western India, despite the fact that these areas lie across the most direct route between the breeding and wintering grounds for the majority of the population. Specimen records (Figure 1) confirm Ticehurst's (1926) suggestion that *P. tytleri* takes an initially south-eastward, then south-westward route on its fall migration, and the reverse on spring migration, not a strictly north-south route (Vietinghoff-Scheel 1984). Though records are still few and further data are needed, it appears that to some extent spring migration follows a more easterly course than that taken in autumn; none of the specimen records east of Mussoorie is from the fall (Figure 1).

A single previously unpublished specimen (BMNH 1965.M.14256) purportedly taken in Chakrata, extreme western Uttar Pradesh, on 5 Nov. 1912, by Col. R. Meinertzhagen, represents the only fall *P. tytleri* specimen traced for the species in the Himalayas or the Siwaliks from after 14 October. Although, admittedly, no other November specimens are known for the species, this seems a late date for this long-distance migrant to still be in the mountains at an elevation of c. 7000'. [Another specimen that Meinertzhagen exchanged to the Museum für Tierkunde, Berlin (ZMB 26.269), labelled by him as being from Srinagar, Kashmir, at 5500', on 12 September 1925, but not listed in his catalogue (R. P. Prŷs-Jones *in litt.* 1998), does not conflict with the species's known range and is suspect only because of its preparation style.] No confidence can be placed in the authenticity of Meinertzhagen's specimen records without careful evaluation (Rasmussen and Collar *in press*, Rasmussen and Prŷs-Jones *in prep.*), and his Chakrata *P. tytleri* specimen is virtually identical in preparation style and its very fresh plumage to that of five fall specimens collected in Simla by W. Davison. In particular it is strikingly similar to BMNH 1886.7.8.834, collected there by Davison on 14 October 1880, and only slightly less so to BMNH 1886.7.8.833, from 3 October 1880; on x-ray view each of these specimens show a characteristic short support stick wrapped for much of its length with x-ray translucent stuffing material. The Berlin specimen was not x-rayed but agrees in all external details with the Davison Simla series as well. The BMNH register lists seven Davison specimens from Simla in this series, but only five so labeled can now be found. The two missing specimens are: BMNH 86.7.8.830, female, 23 September 1880; and BMNH 86.7.8.832, male, 1 October 1880. The 'Chakrata' specimen is less similar both externally and on x-ray views to specimens collected by Whistler ($n = 6$ x-rayed) and Jones ($n = 6$), and no BMNH-registered specimens from the Whistler Collection (which includes Whistler's and some of Jones's specimens) are now missing from the BMNH collection, nor were any of Jones's specimens listed in the BNHS log of his accession missing from that collection in December 1996. In addition, the

Table 1 Dates and localities of *P. tyleri* specimens discussed in this study and mapped in Figure 1.

Specimen number	Locality	Alt. (m)	Date	Sex	Collector	Examined?	Remarks or citation
Jammu & Kashmir, India							
*BMNH	Kishtwar	—	18 June 1907	-	Ward	n	Egg set
BMNH 1949.Wh.1.12606	Kishtwar	1590	23 April 1931	f	Ludlow	y	
BMNH 1949.Wh.1.12607	Kishtwar	2300	04 May 1931	m	Ludlow	y	
*ZMB 26.269	Srinagar	1815	12 September 1925	m	Meinertzhagen	y	
Himachal Pradesh, India							
FMNH 241166	Chamba	—	04 July 1936	f	Koelz	y	possibly breeding; see text
BMNH 1949.Wh.1.12601	Dharmsala	1220	20 September 1921	u	Whistler	y	Whistler (1926)
BMNH 3958.28.9.1921	Dharmsala	1200	28 September 1921	u	Whistler	y	Whistler (1926), 'probably several about'
BMNH 1949.Wh.1.12603	Dharmsala	1200	02 October 1922	u	Whistler	y	Whistler (1926), 'probably several about'
MTD C29828	Patiala	1980	28 March 1920	m	Whistler	y	
BNHS 17364	Patiala	1830	25 March 1921	m	Jones	y	'Common passage migrant September and March, April, May'
BMNH 1949.Wh.1.12605	Fagu, Keonthal (near Simla)	2440	02 May 1920	m	Jones	y	
BNHS 17362	Koti (near Simla)	1830	21 September 1919	m	Jones	y	'several seen on this occasion; call note a low <i>sweet</i> '
BMNH 1949.Wh.1.12604	Koti	2140	21 September 1919	u	Jones	y	'several seen on this date'
BMNH 1941.5.30.4869	Koti	2440	25 September 1921	f	Jones	y	'common passage migrant April-May, Sept.'
BMNH 86.7.8.831	Simla	—	04 October 1878	m	Davison	y	Davison (1883); two others from Simla in Sept. and/or Oct. listed
BMNH 86.7.8.829	Simla	—	17 September 1879	m	Davison	y	Davison (1883)
BMNH 86.7.8.833	Simla	—	03 October 1880	m	Davison	y	Davison (1883)
BMNH 86.7.8.835	Simla	—	04 October 1880	u	Davison	y	Davison (1883)
BMNH 86.7.8.834	Simla	—	14 October 1880	m	Davison	y	Davison (1883)
BNHS 17363	Simla	2140	30 April 1916	f	Jones	y	'Passing through this month'
BNHS 17361	Simla	2140	12 May 1917	m	Jones	y	'Very common...' [rest of label broken off]
BNHS 17366	Simla	2400	18 April 1919	f	Jones	y	'Common on passage April-May'
BMNH 1949.Wh.1.12598	Simla	2300	14 April 1920	m	Jones	y	'common passage migrant Sept.-April'
BMNH 1949.Wh.1.12597	Simla	2300	22 April 1920	m	Whistler	y	'common on passage April and May, returns Sept.'
BMNH 1941.5.30.4864	Simla	2140	30 September 1922	m	Jones	y	'common passage migrant April-May, September'
BMNH 1941.5.30.4867	Simla	2140	03 April 1924	m	Jones	y	
BMNH 1941.5.30.4866	Simla	2140	06 April 1924	u	Jones	y	
BMNH 1941.5.30.4868	Simla	2140	13 April 1924	m	Jones	y	
BMNH 1941.5.30.4865	Simla	2140	23 April 1924	f	Jones	y	
BNHS 17367	Simla	2000	03 October 1925	f	Jones	y	
ZMA 7014	Simla	—	03 October 1925	f	S. Basil-Edwardes	y	
BMNH 1949.Wh.1.12599	Simla	2140	09 October 1925	u	Jones	y	
BMNH 1949.Wh.1.12600	Simla	2140	11 October 1925	m	Whistler	y	'on migration'
BNHS 17365	Simla	2000	01 October 1926	f	Jones	y	

Uttar Pradesh, India							
*BMNH 1965.M.14256	Chakrata	2100	05 November 1912	m	Meinertzhagen	y	Not mapped; see text
MSU 5986	Mussoorie	2000	20 March 1965	m	Fleming	y	Fleming (1968)
MSU 5997	Mussoorie	2700	03 October 1965	u	Fleming	y	Fleming (1968)
USNM 536237	Mussoorie	1700	30 March 1968	u	Jantzen	y	Previous identification <i>P. trochiloides</i>
KUMNH 71187	Mussoorie	?	27 March 1973	u	Waltner	y	Previous identification <i>P. collybita</i>
KUMNH 78886	Mussoorie	2200	27 March 1973	m	Waltner	y	Previous identification <i>P. collybita</i>
*BMNH	Garhwal	---	27 June 1908	---	Whymper	n	Egg set
BMNH 86.7.8.836	Almora	---	April 1868	u	Brooks	y	Brooks (1872b)
BMNH 86.7.8.837	Etawah	---	07 April 1879	f	Brooks	y	Brooks (1872b)
*[specimen not traced]	Gorakhpur	---	18 February 1910	?	Hope Simpson	n	Osmaston (1913): 'An uncommon bird'
Nepal							
FMNH 276955	Dandeldura	2140	09 April 1965	f	Fleming	y	Fleming & Traylor (1968)
Madhya Pradesh, India							
LACM 33031	Balaghat	---	19 March 1959	m	Machris	y	Previous identification <i>P. collybita tristis</i>
BMNH 98.12.12.717	Raipur	---	14 March 1870	u	Blanford	y	'originally identified as <i>viridanus</i> '
Maharashtra, India							
*ROM 66799	?Mahabaleshwar	---	---	u	---	y	'Locality deduced'; see text
BMNH 1925.12.23.1454	Dhule [= Dhulia]	---	07 October 1884	f	Davidson	y	original identification <i>viridanus</i>
BNHS 17380	Malegaon	300	27 February 1948	f	Ali	y	'in heavy moult!'; Ali (1955): "species was not uncommon where the specimens were collected"
MCZ 278479	Malegaon	300	27 February 1948	m	Ali	y	'in heavy moult!'; Ali (1955): "species was not uncommon where the specimens were collected"
MCZ 278480	Malegaon	300	28 February 1948	[f]	Ali	y	'in heavy moult!'; Ali (1955): "species was not uncommon where the specimens were collected"
BNHS 5922	Matheran	---	07 January 1905	m	Woodman	y	Abdulali (1986)
BMNH 88.2.20.190	Khandala	---	04 March 1876	m	Fairbank	y	Fairbank (1876): listed as <i>P. viridanus</i> therein
BMNH 88.2.20.191	Savantvadi [= Sawant Wadi]	---	April 1875	m	Fairbank	y	Fairbank (1876): listed as <i>P. viridanus</i> therein
Karnataka, India							
FMNH 241168	Londa	---	12 January 1938	m	Koelz	y	Koelz (1942): 'occasional specimens seen'
FMNH 241167	Londa	---	14 February 1938	m	Koelz	y	Koelz (1942): 'occasional specimens seen'
Tamilnadu, India							
[specimen not traced]	Udagamandalam [= Ootacamund]	---	22 January [1881-3]	u	Davison	n	Davison (1883), Whistler & Kinnear (1933)
BMNH 86.7.8.838	Udagamandalam	---	10 March 1881	m	Davison	y	Davison (1883), Whistler & Kinnear (1933)
FMNH 241171	Udagamandalam	---	01 March 1948	m	Koelz	y	
AMNH 468388	Udagamandalam	---	01 March 1948	f	Koelz	y	

*Doubt exists for these records; see text.

'Chakrata' specimen does not closely resemble in style that of numerous other specimens supposedly obtained there by Meinertzhagen during the same time period, and currently under study (Rasmussen and Prÿs-Jones in prep.). Based on this and strong evidence of many other specimens with falsified data in the Meinertzhagen collection, I consider that both Meinertzhagen specimens were in fact collected in Simla, one in late September and the other in early October, by Davison, so neither record is included in the map.

Five *P. tyleri* specimens that were presumably on migration through the Mussoorie area of north-western Uttar Pradesh were examined (Figure 1, Table 1). These are MSU 5997 and 5986 (collected 3 October and 20 March 1965 respectively, by R. L. Fleming, Jr.); University of Kansas Museum of Natural History (KUMNH) 71186 and 71187 (previously identified as Common Chiffchaffs *Phylloscopus collybita*; both collected 27 March 1973 by R. C. Waltner); and USNM 536237 (previously identified as a Greenish Warbler *Phylloscopus trochiloides*, collected 30 March 1968 by J. Jantzen). These previously unpublished spring records suggest that *P. tyleri* may be regular in the Mussoorie area in the spring, although it was listed as 'occasional' in spring by Fleming (1968). Fleming listed the species as a common fall transient ('arriving by late September') in the region, but only one fall specimen from Mussoorie (that collected by Fleming) has been located; this is the easternmost fall specimen available.

A record of *P. tyleri* collected at Gorakhpur, north-eastern Uttar Pradesh by Mr. Hope Simpson (Osmaston 1913; Figure 1), is the north-easternmost for the species, and it is also the only non-spring record east of Mussoorie. This record has not been cited in recent treatments except Vietinghoff-Scheel (1984), and A. E. Osmaston's (1913) statement that *P. tyleri* was 'an uncommon bird' there seems surprising for a species so far from its known range, and so far to the north in February. Although Whistler and Kinnear (1935) stated that a Gorakhpur specimen published by Osmaston (1913) as *Caprimulgus mahrattensis* (but which actually was a juvenile *C. monticolus*) 'is in [Whistler's] collection together with the rest of A. E. Osmaston's skins', implying that the *P. tyleri* in question would be included, there is no indication in the BMNH register of Whistler's collection of a *Phylloscopus* specimen of any species with the appropriate date and locality information (R. P. Prÿs-Jones in litt.), and despite considerable effort no *P. tyleri* specimen from Gorakhpur could be traced for the present study. Because of the above, it is possible that the Gorakhpur record may represent a misidentification and it is here considered to require verification.

Ali and Ripley (1983) list passage records from '... Khandesh, M.P. and U.P. (Etawah)...', but here it should be clarified that Khandesh is in Maharashtra, and the 'M.P.' almost certainly refers to a record from Central Provinces (Ticehurst 1938) which was presumably based on a Raipur specimen (BMNH 98.12.12.717) collected by W. T. Blanford on 14 March 1870, the label of which bears the annotation 'originally identified as *viridanus*' [*P. trochiloides viridanus*], but with no indication as to when or by whom it was reidentified. A record mentioned by Ripley (1978) for the Tapti River in Madhya Pradesh (M.P.) could not be traced in this study, and 'M.P.' may be a *lapsus* for Maharashtra. An

overlooked specimen of *P. tyleri* (previously identified as *P. collybita tristis*) from central India was located in the collections of the Los Angeles County Museum: LACM 33031, a male collected by M. A. Machris on 19 March 1959, at Lougur, Balaghat Forest Division, Madhya Pradesh (ca. 22°N 80°E). Thus there are now at least two valid records from Madhya Pradesh, suggesting that the species may be at least an occasional, if not regular, spring migrant through the Satpura Range and other low hills of central India.

WINTER RANGE OF *P. TYTLERI*

Specimen records of presumed wintering *P. tyleri* are mapped in Figure 1, with fuller detail presented in Table 1. There appears to be no basis for the unreferenced, erroneous statement by Sibley and Monroe (1990, uncorrected in Sibley and Monroe 1993) that *P. tyleri* winters in Myanmar (Burma); there appear to be no actual records for the country, and the species is not listed in Smythies (1986 and earlier editions). Vietinghoff-Scheel's (1984) mention of *P. tyleri* in the Eastern Ghats is actually in reference to specimens from the Nilgiris; no authentic Eastern Ghats records are known; this error probably arose from the title of the paper in which the Nilgiris records are mentioned (Whistler and Kinnear 1933).

A *P. tyleri* specimen lacking an original label from the Royal Ontario Museum (ROM 66799, previously identified as '*Urosphena p. pallidipes*; *Acanthopneuste*') lacks definite data but was deduced by an unknown person and for unknown reasons to come from Mahabaleshwar, as discussed above. It was received as part of an exchange from Queen's University Museum of Biology, and no further information was available (B. Millen, in litt. 1996). This specimen is in very bright fresh plumage and is a full adult, showing broad rectrices and a completely ossified cranium in a radiograph. Although of unknown date, in plumage it is consistent only with an early fall adult. Questions are raised about the 'Mahabaleshwar' locality of this specimen by the fact that a few other ROM specimens (such as *Ammodendrix griseogularis*) with the same deduced locality are most unlikely to have originated at Mahabaleshwar except through trade or as part of a collection assembled there from various localities, based on their known distribution and habitat requirements. In preparation style it does not match specimens of other collectors of non-breeding individuals of this species, including either externally or, on x-rays, that of two *P. tyleri* specimens collected by Fairbank not far from Mahabaleshwar (Savantvadi and Khandala) in March and April, but originally misidentified as *P. viridanus* and thus not mentioned in Fairbank's (1876) account of the region's avifauna. However, both externally and internally, the 'Mahabaleshwar' specimen is similar in preparation style to several specimens of other passerine taxa now at FMNH, from the Winsor collection, collected at Sirur (18°50'N 74°23'E, c. 100 miles from Mahabaleshwar) (FMNH 19471–19474, *Saxicoloides fulicata*; FMNH 19475, *Monticola solitaria*) and from Mahabaleshwar (FMNH 19476–19477, *Turdus merula nigropileus*). The above Winsor specimens and the ROM specimen all share the following distinctive features: they have open

low belly incisions; their heads are tilted; they lack support sticks, or wound cotton or paper neck wands; most (including the ROM bird) have both legs lying together rather than being crossed; they have a similar fine-grained x-ray opaque (presumably arsenic) preservative pattern on the inside of the skin; and the skulls have only a small hole cut at the base. The similarities between these specimens, especially the lack of any neck support, make it appear likely that the ROM *P. tytleri* was collected by Winsor, quite possibly at or near Mahabaleshwar as tentatively noted on the label.

Recently a specimen originally identified as *P. tytleri* (USNM 583081), which was collected by S. D. Ripley at Tikarpara, near the Mahanadi River, Dhenkanal District, Orissa on 17 February 1975, and the basis for the record of *P. tytleri* mentioned in Ripley (1978, 1982), was found to be a *P. trochiloides* (probably ssp. *viridanus*). The specimen, sexed as a probable male, shows an entirely pale lower mandible, recorded as 'dull orange' on the label; its bill is not as slender as is typical of *P. tytleri*; and it has an inconspicuous narrow, ill-defined whitish wingbar formed by narrow pale tips on the greater secondary coverts, all characters that differentiate *P. trochiloides* from *P. tytleri*. The measurements of USNM 583081 are: culmen (from skull) = 12.8 mm; wing (flattened and straightened) = 55.3; tarsus = 17.9 mm; tail (from insertion) = 42.7 mm. Slight damage to the base of the upper mandible gives the specimen a rather slender- and long-billed appearance that is atypical for *P. trochiloides*.

A *P. tytleri* specimen, purported to be the only one from Goa (Grubh and Ali 1976), was subsequently reidentified as *P. trochiloides* (Price 1980). However, Whistler and Ticehurst (MS), in a work in preparation prior to 1941, listed Goa as part of the range of *P. tytleri*, so there must have been an earlier Goa-collected specimen for which the present disposition is unknown. Another erroneous record of *P. tytleri* that has previously been corrected (Ticehurst 1938), but which has continued to be cited as valid, is Inglis's (1904) record from Tirhut, Bihar. The above-documented frequency of misidentifications of specimens of *P. tytleri* makes it very likely that additional specimens await correct identification among museum series of similar congeners.

SIGHT REPORTS

Sight records of *P. tytleri* away from its breeding grounds and presumably on migration include several western Nepal sightings in April (Inskipp and Inskipp 1991); one near Mussoorie on 28 March 1981 (P. Kaestner, unpubl. data); 30 specimen-supported observations at Mussoorie from 5–25 March and 'late Sept.' (Fleming 1968); two in Corbett, Uttar Pradesh, on 21 March 1991 (P. Alström *in litt.* 1996), and a 23 August sight record thought to be of this species on the Delhi Ridge (Gaston 1978) which is presumably the basis for the listing of Haryana in the species's range in Ripley (1982). These relatively eastern sight records of *P. tytleri* support the specimen-based hypothesis that the species takes a somewhat more easterly route in spring migration. *P. tytleri* was listed as 'seen regularly' at Rajaji National Park, north-western Uttar Pradesh (Pandey *et al.* 1994),

but was categorized as an 'altitudinal migrant' and a 'wintering' species there. This is almost certainly misleading terminology, presumably due to the status codes adopted in that paper; the species is otherwise (except for the clearly fraudulent Meinertzhagen specimen discussed above) known only as a migrant through that region, wintering much farther south (Figure 1). Hartert (1910) and Bates and Lowther (1952) also stated, without providing evidence, that some winter in the outer hills and adjacent plains. *P. tytleri* is listed by Abdulali and Panday (1978) as an 'uncommon passage migrant' from the Bharatpur/Agra area, presumably on the basis of a record of nine ringed at Bharatpur in 1970 (no date given) during the MAPS program (McClure and Porntip Leelavit 1972). Subsequently there has been one sight record, on 5 February 1987, from Bharatpur, for which details were not provided (Jepson 1987). As no documentation appears to be available to support the ringing of so many *P. tytleri* specimens during one year at Bharatpur, where it has otherwise only been recorded once, and none of the ringed birds was reported as having been recaptured (McClure 1984), this record is highly questionable.

Winter sight reports of *P. tytleri* include a well-documented record of two seen near Munnar, Kerala (Harrap and Redman 1989, Neelakantan *et al.* 1993), a possible earlier record from the Nilgiris (Betts 1930), 'occasional' records from Wynaad, Kerala (Zacharias and Gaston 1993), three undocumented reports from Goa (Harris 1986), two from around Bombay (N. Jamdar *in litt.* 1997, T. Price *in litt.* 1998), and a report without details from Rajiv Gandhi (= Nagarhole) National Park, Karnataka (Lal *et al.* 1994). Additional sight records as noted on specimen labels and/or resultant publications, and validated by accompanying voucher specimens from the same locality, collector, and date, are summarized in Table 1. *P. tytleri* must certainly be to some extent overlooked in its winter quarters, but the fact that expert observers have not found it outside its breeding range despite special effort (B. King, P. Holt, K. Kazmierczak verbally 1997) must be taken as an indication that either it occurs at a low density or very locally (the latter supported by the recent finding of extremely high densities in one locality in southern Maharashtra: T. Price *in litt.* 1998).

MORPHOLOGICAL DISCRIMINATION OF *P. TYTLERI*

Measurements of *P. tytleri* taken for this study are summarized in Table 2, and accord well with Ticehurst's (1938) four basic measurements (culmen from skull, tarsus, flattened wing, and tail) of both sexes combined. No sexual dimorphism was detected in these measurements (Table 2), although the correctness of sexing of individual specimens may be doubted. This is supported by the great preponderance of specimens sexed as males (27 males:11 females) that were obtained away from the breeding grounds. At least in fall and winter, both sexes would be expected to be more equally detectable and collectable, and fall adults and immatures with minute or obscure gonads are more likely to be missexed as males due to the superficial similarity of the adrenal glands to testes.

Table 2 Summary statistics for measurements (in mm) of *P. tyleri* specimens examined in this study.

Overall measurements include all sexed and unsexed individuals.

	Culmen (ff)	Culmen (fs)	Tarsus	Wing	Tail	Tail x100/wing
Males						
Mean ± S.D.	9.2 ± 0.64	13.1 ± 0.54	18.7 ± 1.20	58.5 ± 2.33	39.7 ± 2.35	68.0 ± 3.06
Range	8.4–11.1	12.0–14.6	16.5–21.9	53.5–63.5	35.4–43.8	62.1–73.7
n	29	28	29	30	30	24
Females						
Mean ± S.D.	9.4 ± 0.68	12.9 ± 0.45	18.0 ± 0.85	57.2 ± 1.56	38.2 ± 2.16	66.8 ± 3.36
Range	8.6–10.5	12.0–13.4	16.5–19.7	55.0–60.0	34.7–42.1	61.4–70.3
n	12	12	13	12	13	7
Overall						
Mean ± S.D.	9.2 ± 0.64	13.2 ± 0.60	18.4 ± 1.20	58.0 ± 2.28	39.1 ± 2.18	67.6 ± 2.87
Range	8.2–11.1	12.0–14.9	13.2–21.9	53.0–63.5	34.7–43.8	61.4–73.7
n	59	58	60	59	61	45

Table 3. Summary statistics of measurements of *P. tyleri* and similar species (all measurements by author).

Species	Nasal Groove Length			Rictal Bristle Length			Bill Depth		
	x ± S.D.	Range	n	x ± S.D.	Range	n	x ± S.D.	Range	n
<i>P. tyleri</i>	2.6 ± 0.39	1.9–3.6	58	3.2 ± 0.37	2.5–3.9	54	1.46 ± 0.19	1.1–1.7	18
<i>P. c. tristis</i>	1.0 ± 0.33	0.6–1.5	16	4.0 ± 0.48	3.0–4.7	15	1.36 ± 0.17	1.1–1.6	16
<i>P. [c.] sindianus</i>	1.5 ± 0.34	0.9–1.8	6	4.3 ± 0.59	3.5–4.9	6	1.53 ± 0.24	1.2–1.8	6
<i>P. trochiloides</i>	1.6 ± 0.28	1.0–2.1	25	6.1 ± 1.08	3.9–8.4	20	1.88 ± 0.20	1.6–2.2	26
<i>P. t. nitidus</i>	1.3 ± 0.36	0.8–1.9	11	4.9 ± 0.57	4.0–5.9	11	1.94 ± 0.32	1.5–2.6	11

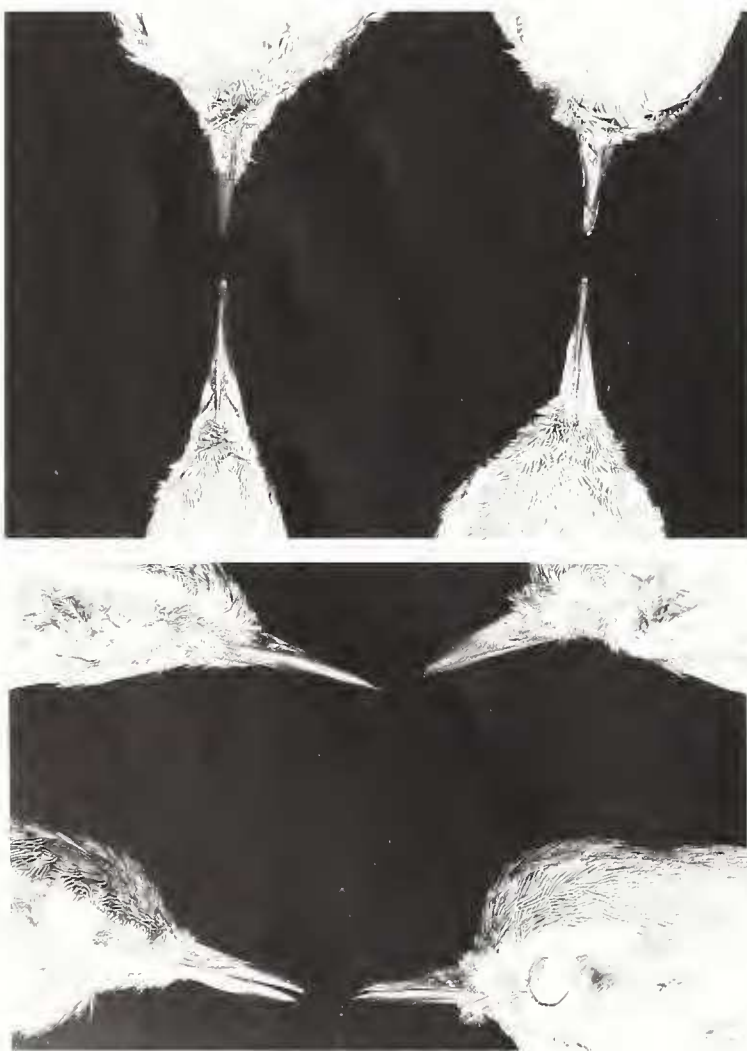


Figure 2. Close-ups (lateral view, upper photo; dorsal view, lower photo) of bill shapes and feathering of adult (ROM 66799; top left upper photo, top right lower photo) and juvenile *P. tyleri* (FMNH 241170; lower left upper photo, upper left lower photo) in comparison with *P. [collybita] sindianus* (USNM 162883; top right upper photo, lower right lower photo) and *P. trochiloides viridanus* (USNM 408896, lower right upper photo, lower left lower photo).

Bill shape and feathering

The slender, spike-like bill of *P. tyleri* is accentuated by the reduced extent of feathering at the base of the bill compared with similar species (Figure 2). With experience or in direct comparison, this feature is diagnostic for birds in the hand, and should also impart a distinctive appearance to birds seen well in the field. Other species with which *P. tyleri* is likely to be confused have more extensive feathering at the base of the nostrils, giving them a more gradually sloping bill base/forehead junction. In addition, *P. tyleri* has very short, fine, inconspicuous rictal bristles (Ticehurst 1938; Figure 2, Table 3); other similar species normally have somewhat to considerably longer and stronger rictal bristles; these are especially prominent on *P. trochiloides*. Though the diagnostic bill shape of adults of *P. tyleri* (Plate 1, Figure 2) was originally quite well described (Brooks 1871, 1872a), subsequent discussions have been less clear, so clarification is provided here: from the side, the bill of *P. tyleri* appears less deep at the very base than in other similar species, and is more nearly uniform in depth throughout its length except near the tip; there is little or no perceptible swelling of the gonys, unlike *P. trochiloides* and *P. t. nitidus*, and it appears more pointed and pincer-like at the tip. The bill of *P. tyleri* is not very different in shape, nor does it average more slender than from those of *P. collybita tristis* or the Mountain Chiffchaff *Phylloscopus [c.] sindianus* (Figure 2), this impression merely being created by the greater length of the bill of *P. tyleri* (Table 3). The bill of *P. tyleri* is, however, noticeably finer than are those of *P. trochiloides* and *P. t. nitidus*, usually finer even than small specimens of the variable *P. trochiloides*; larger-billed individuals of *P. trochiloides* may have bills just as long as (but definitely heavier than) those of *P. tyleri*.

A diagnostic feature that has not been mentioned previously is the long exposed nasal groove of *P. tyleri* (Table 3, Figure 2). The long nasal groove is accentuated



Plate 1. *P. tyleri* in Kashmir, May 1983 (photo courtesy U. Olsson; digitally enhanced and colour-matched to spring specimens).

by the near lack of nasal tufts, which are prominent (on close inspection) on the other taxa. In direct comparison of birds in the hand, this difference can be clearly seen, but measurements are advisable. This measurement should be taken from the distal edge of the feathering at the bill base (not including rictal bristles) to the distal edge of the groove in which the nostrils are situated. While there was only minimal overlap between *P. tyleri* and similar species in nasal groove length (Table 3), other distinctive features should be taken into account as well when making an identification, especially in borderline cases. As the measurements in Table 3 were taken from dried specimens, they may be very slightly smaller than would be those of live birds. Note that in exceptional cases, missing or broken rictal bristles or loss of some feathers at the base of the bill of other species can emulate the features of *P. tyleri* to some extent.

Bill colour

The lower mandible is apparently never bright orange- or flesh-coloured in *P. tyleri* as in most *P. trochiloides viridanus* and *P. t. nitidus*, nor is it ever jet-black as in *P. collybita tristis*; usually the base of the lower mandible is slightly to clearly paler than the rest of the bill but of a dusky horn colour. Soft part notations on specimen labels include: 'bill blackish brown, base of lower m. horny'; 'apical half of l. m. blackish brown, rest of l. m. and gape yellowish'; 'bill horn, commissure dusky yellow'; 'bill dark brown, base of lower m. horny yellow'; 'l. m. pale brown, yellow at base and on edges along commissure'; 'bill dark horn, paler at base of l. m.'

Plumage of adults

The previous misidentifications of *P. trochiloides* as *P. tyleri* may have been partially due to the fact that worn or moulting *P. trochiloides* sometimes have the wingbars



Figure 3. Specimens of *P. tyleri* (FMNH 241169, juvenile; MSU 5997, first-winter; FMNH 241171, ad. March; FMNH 241166, ad. July) showing the range of plumage variation.

reduced or absent. Presence and conspicuousness of the wingbar in *P. trochiloides* is dependent upon moult schedule and wear (Price 1980), and dichotomous keys to the genus do not provide for *P. trochiloides* which have lost their wingbars (Ticehurst 1938, Williamson 1962, Ali and Ripley 1983). *P. tyleri*, which has two body moults a year (Ticehurst 1938), shows pronounced

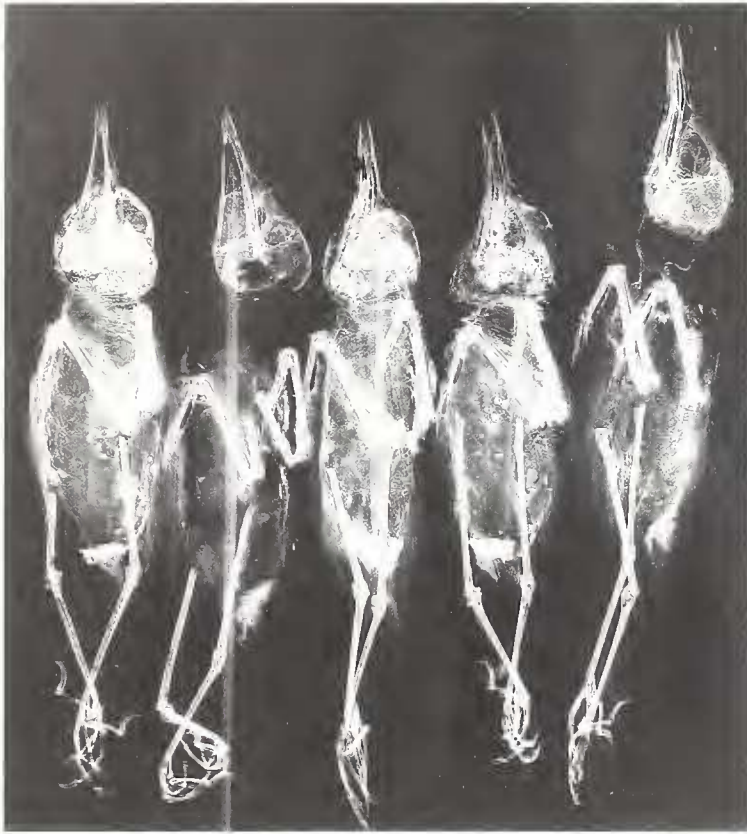


Figure 4. Radiographs of skin specimens of adult, first-winter, and juvenile *P. tyleri*, to show degrees of cranial and tarsometatarsal ossification. Left to right, FMNH 241169 (4 Aug. 1936, juvenile), MSU 5997 (3 Oct. 1965, first-fall), FMNH 241171 (1 Mar. 48, adult), FMNH 241170 (4 Aug. 1936, juvenile), ROM 66799 (no date, ad.).

colour variation (Figure 3), and this no doubt contributes to the frequency of misidentifications and paucity of reliable records outside the breeding season.

First-fall and freshly moulted birds are brighter green above and have yellow-suffused underparts; some also show pale bases to the lower mandible. Most birds seen on passage both in fall and to a lesser extent early spring would show yellow-suffused lower underparts and supercilium, and fairly bright olive upperparts. The brightest individuals might be mistaken for its near relative (Richman and Price 1992), Tickell's Leaf Warbler *Phylloscopus affinis*, which approaches *P. tyleri* in bill length and thinness (Price and Jamdar 1990), but *P. affinis* is almost uniformly fairly bright lemon-yellow below, including the throat which is apparently never yellow on *P. tyleri*.

Worn *P. tyleri* are considerably greyer above than they are in fresh plumage, and often lack any trace of yellowish below, sometimes even being dingy whitish on the lower underparts and with a greyish breast. These duller, greyer individuals invite confusion especially with *P. collybita tristis*, *P. [c.] sirdianus* and *P. neglectus*, but should be recognizable by the longer, paler-based bill, and much darker and more prominent eyestripe. *P. tyleri* on the breeding grounds in mid- to late summer shows the greatest degree of wear and drabest plumage, and just prior to the winter moult can also be quite dull-plumaged.

Adult *P. tyleri* may best be recognized in the field by the combination of mostly or entirely dark lower mandible; the rather long, uniformly slender, spike-like bill; olive upperparts; the rather short tail; the very long, prominent pale supercilium above a broad dark eyestripe; and the lack of wingbar and pale tertial spots.

While some *P. trochiloides* (especially the nominate race, with which *P. tyleri* does not normally overlap in range) may have a mostly dark lower mandible (Harrap and Redman 1989; Roberts 1992), probabilities are low that this character would be found in individuals of *P. trochiloides* for which the wingbar is also completely lacking on both sides, the bill is long and slender, and the tail is relatively short. Rarely, very worn Hume's Warblers *Phylloscopus humei* almost completely lose their pale tertial spots and/or wingbars (e.g. USNM 131117, 150435), being then very like worn *P. tyleri* except for the much shorter bill.

Juveniles

Juveniles are said to have slightly shorter bills (Inskipp and Inskipp 1991), which increases their resemblance to *P. trochiloides*. Of 13 adults and one first-winter specimen, mean bill length (from feathers) was 9.4 ± 0.55 mm, compared with five definite juveniles, for which mean bill length was 8.9 ± 0.19 . Sample sizes are too small for statistical analysis but these results appear to confirm that juveniles are shorter-billed. In addition, juveniles have noticeably browner breast sides than do adults, with virtually no yellow tinge on underparts; the upperparts are brownish-olive, greener on wing and tail edgings and with a slightly browner crown.

First-fall specimens

Analysis of x-rays of *P. tyleri* confirms that field identification of first-winter vs. adult individuals must normally be impossible, unless the birds are in the hand. Adults were distinguished on the x-rays by their double-layered skulls, visible on each side of the skull, and presence of bony struts visible as opaque dots over the entire roof of the cranium (Fig. 4). Figure 4 shows x-rays of the crania of one easily aged adult (right-most) and one first-fall specimen (second from left), while the other three specimens are difficult to age by cranial ossification due to their styles of preparation. This is due to the use of x-ray opaque preservatives, which also can result in a stippled pattern mimicking that of skull ossification; as well as the fact that the skulls are somewhat crushed in these specimens. In the juvenile specimens it can be seen that the proximal portion of the shaft of the tarsometatarsus is somewhat swollen in comparison with the other specimens; it does not appear possible to distinguish the first-fall bird from adults on this feature. The single first-fall bird (MSU 5997, Mussoorie, 3 October 1965, Fig. 4), which was definitely aged as such on the basis of its having a mostly unossified skull shown in x-rays and narrow rectrices, shows strongly yellow-washed lower underparts, grey-mottled breast, and a pale-based bill (Fig. 3), but is matched in all these features by some fresh fall adult specimens. For the small sample of fall specimens studied, rectrices were broad in two A. E. Jones specimens labelled adult by the preparator (BNHS 17362, 17367); narrow in one Jones specimen labelled 'juv by skull' (BMNH 17365); and broad in four of five Simla Davison specimens (including the Meinertzhagen specimen).

While growth bars could be seen on rectrices of some individuals, it could not be determined whether they matched up between rectrices, and so no conclusions were drawn as to age of specimens on that basis.

Pollen staining

Patches of reddish pollen can be seen adhering to the foreheads and sometimes also the chins of eight of nine March specimens; all ten April specimens; and four of eight May specimens. None of the specimens examined for other months had definite pollen on their heads. A sample of pollen analysed proved to be extremely small-grained, and of an as yet unidentified species, but it is probably the same as that also found on some USNM prinia specimens (J. Kress, verbally 1996). Pollen is frequently seen on netted *P. tytleri* in spring but not in the breeding season (Price and Jamdar 1991; T. D. Price *in litt.* 1995, 1996). Alexander (1969) saw *P. tytleri* feeding at a Flame of the Forest *Butea monosperma* (Lam.) Kuntze, tree at Malegaon in the Surat Dangs in late February. In this case the warbler's identification was verified by three specimens collected by S. Ali and now at BNHS and MCZ, while the tree is of an introduced Malagasy species (J. Kress verbally 1996). Pollen was not, however, seen on the Malegaon specimens known to have been feeding among flowers. N. Jamdar (*in litt.* 1997) has twice seen *P. tytleri* feeding on Flame of the Forest trees near Bombay. In an examination of all USNM specimens of the potential confusion *Phylloscopus* species listed in Table 1, none had obvious reddish pollen on their heads. Thus, the flower-probing habits of *P. tytleri* (shared with the dissimilar-looking Buff-barred Warbler *Phylloscopus pulcher*: P. Alström *in litt.* 1996; P. D. Round, photograph) may provide a supplementary clue to identification in spring, and on a close view in the field, reddish pollen may be visible on the forehead. The thin bill of *P. tytleri* is apparently related to the species's propensity for foraging by picking and probing in various substrates rather than flycatching (Price 1991, Richman and Price 1992, T. D. Price *in litt.* 1995).

While some individuals of *P. tytleri* are fairly readily distinguished, others require considerably more care for reliable identification. Sight records of this plain but variable species, especially outside the known breeding grounds, should be carefully documented by notes, photographs, and recordings of any vocalizations (the latter are treated by Martens 1980, Harrap and Redman 1989, Roberts 1992). However, many sight records, even if carefully documented, cannot be taken as definitive. Netting records of birds outside the known breeding grounds or range extensions should be accompanied with full details, appropriate measurements (especially nostril groove length), close-up photographs showing bill structure and feathering at base of bill, and, ideally, specimens to enable critical independent evaluation. Increased awareness of the identification criteria for *P. tytleri*, when rigorously applied, will eventually result in an improved understanding of the non-breeding range, behaviour, and ecology of this little-known, near-endemic, near-threatened species of the Indian subcontinent.

For information, specimen loans, and/or access to collections, thanks are due M. LeCroy, AMNH; R. Prŷs-Jones and M. P. Walters, BMNH; S. Unnithan, BNHS; D. Willard, FMNH; D. Beaver and L. Abraczinskas, MSU; R. A. Paynter, Jr., MCZ; S. Eck, Staatliches Museum für Tierkunde, Dresden (MTD); K. Garrett, LACM; S. L. Olson, G. R. Graves, and J. P. Angle, USNM; R. Prum and M. Robbins, KUMNH; B. Millen, ROM; R. B. Payne and J. Hinshaw, UMMZ; K. Roselaar, Zoologisch Museum, University of Amsterdam

(ZMA); S. Frahnert, ZMB; J. Fjeldsa, ZMUC. Others who provided help and information include N. Rai, Pennsylvania State University; P. Kaestner, U. S. State Department; B. F. King; K. Kazmierczak; P. Holt; P. Alström; K. Winker, now of University of Alaska; T. D. Price and M. Katti, University of California at San Diego; N. Jamdar; R. L. Zusi, USNM. J. Kress, NMNH, examined pollen samples from feathers of *P. tytleri*. I thank U. Olsson for providing a photo of *P. tytleri*. E. Rivinus helpfully translated a German account of the species, and K. Swagel x-rayed some FMNH specimens. Earlier drafts of the manuscript were improved by T. D. Price, G. R. Graves, P. Alström, and M. D. Gottfried, Michigan State University Museum.

REFERENCES

- Abdulali, H. (1986) A catalogue of the birds in the collection of the Bombay Natural History Society. Part 31. *J. Bombay Nat. Hist. Soc.* 83: 339-359.
- Abdulali, H. and Panday, J. D. (1978) Checklist of the birds of Delhi, Agra and Bharatpur with notes on their status in the neighbourhood. Bombay: Privately publ.
- Alexander, H. G. (1950) Some notes on the genus *Phylloscopus* in Kashmir. *J. Bombay Nat. Hist. Soc.* 49: 9-13.
- Alexander, H. G. (1969) *Some notes on Asian leaf-warblers (genus Phylloscopus)*. Privately publ., TRUEXpress.
- Ali, S. (1955) The birds of Gujarat. Part II. *J. Bombay Nat. Hist. Soc.* 52: 735-802.
- Ali, S. and Ripley, S. D. (1983) *Handbook of the birds of India and Pakistan*. Compact ed. Delhi: Oxford University Press.
- Baker, E. C. S. (1924) *The fauna of British India, including Ceylon and Burma*. Birds, 2. Second ed. London: Taylor and Francis.
- Baker, E. C. S. (1933) *The nidification of the birds of the Indian Empire*, 2. London: Taylor and Francis.
- Bates, R. S. P. and Lowther, E. H. N. (1952) *Breeding birds of Kashmir*. London: Oxford University Press.
- Betts, F. N. (1930) Migration notes in 1929 from the Nilgiri District. *J. Bombay Nat. Hist. Soc.* 34: 569.
- Biddulph, J. (1881) On the birds of Gilgit. *Ibis* (4)5: 35-102.
- Biddulph, J. (1882) On the birds of Gilgit. *Ibis* (4)6: 266-290.
- British Ornithologists' Union (B.O.U.) Council (1997) The Meinertzhagen Collection of birds at The Natural History Museum, Bird Group, Tring, U.K. *Ibis* 139: 431.
- Brooks, W. E. (1871) Notes on the ornithology of Cashmir. *Proc. Asiatic Soc. Bengal* 1871: 209-210.
- Brooks, W. E. (1872a) On a new species of *Phylloscopus*. *Ibis* (3)2: 22-23.
- Brooks, W. E. (1872b) On the breeding of *Reguloides superciliosus*, *Reguloides proregulus*, *Reguloides occipitalis* and *Phylloscopus tytleri*. *Ibis* (3)2: 24-31.
- Collar, N. J., Crosby, M. J. and Stattersfield, A. J. (1994) *Birds to watch 2: the world list of threatened birds*. BirdLife Conserv. Ser. No. 4. Cambridge: BirdLife International.
- Davidson, J. (1898) A short trip to Kashmir. *Ibis* (7)4: 1-42.
- Davison, W. (1883) Notes on some birds collected on the Nilghiris and in parts of Wynnaad and southern Mysore. *Stray Feathers* 10: 329-419.
- Fairbank, S. B. (1876) List of birds collected in the vicinity of Khandala, Mahableswar, and Belgaw along the Sahyadri Mountains, and near Ahmednagar in the Dakhan. *Stray Feathers* 4: 250-268.
- Fleming Jr., R. L. (1968) The birds of Mussoorie, U. P., India—a distributional and ecological study. Unpubl. Ph.D. diss. East Lansing, Michigan: Michigan State Univ.
- Fleming Sr., R. L. and Traylor, M. A. (1968) Distributional notes on Nepal birds. *Fieldiana (Zool.)* 53(3): 147-203.
- Gaston, A. J. (1978) The seasonal occurrence of birds on the New Delhi Ridge. *J. Bombay Nat. Hist. Soc.* 75: 115-128.
- Grubh, R. B. and Ali, S. (1976) Birds of Goa. *J. Bombay Nat. Hist. Soc.* 73: 42-53.
- Harrap, S. C. and Redman, N. J. (1989) Some observations of scarce birds in Kerala and Tamil Nadu. *J. Bombay Nat. Hist. Soc.* 86: 460-461.
- Harris, P. (1986) *Goa. The independent birders' guide*. Lowestoft: Eastern Publications.

- Harrison, C. J. O. (1966) Some clutches of wader eggs from E. C. S. Baker. *Bull. Brit. Orn. Club* 86: 96–97.
- Harrison, C. J. O. and Parker, S. A. (1966a) The eggs of the White-tailed Blue Chat, *Cinclidium leucurum*, and the Large Niltava, *Niltava grandis*. *Bull. Brit. Orn. Club* 86: 71–73.
- Harrison, C. J. O. and Parker, S. A. (1966b) The identification of the eggs of the Indian Hill Partridges of the genus *Arborophila*. *J. Bombay Nat. Hist. Soc.* 63(3): 748–750.
- Harrison, C. J. O. and Parker, S. A. (1967) The eggs of Woodford's Rail, Rouget's Rail and the Malayan Banded Crane. *Bull. Brit. Orn. Club* 87: 14–16.
- Hartert, E. (1910) *Die Vögel der paläarktischen Fauna. Systematische Übersicht der in Europa, Nord-Asien und der Mittelmeerregion vorkommenden Vögel*. Berlin: R. Friedländer und Sohn.
- Inglis, C. M. (1904) The birds of the Madhubani sub-division of the Darbhanga District, Tirhut, with notes on species noticed elsewhere in the district. Part VIII. Addenda et corrigenda. *J. Bombay Nat. Hist. Soc.* 16: 70–75.
- Inskipp, C. and Inskipp, T. (1991) *A guide to the birds of Nepal*. Second ed. Washington, D. C.: Smithsonian Institution Press.
- Jepson, P. (1987) Recent reports. *Oriental Bird Club Bull.* 6: 36–40.
- Jones, A. E. (1919) A list of birds found in the Simla hills 1908–1919. *J. Bombay Nat. Hist. Soc.* 26: 601–620.
- Jones, A. E. (1948) The birds of the Simla and adjacent hills. Part III. *J. Bombay Nat. Hist. Soc.* 47: 409–432.
- Knox, A. G. (1993) Richard Meinertzhagen—a case of fraud examined. *Ibis* 135: 320–325.
- Koelz, W. N. (1942) Notes on the birds of the Londa neighbourhood, Bombay Presidency. *J. Bombay Nat. Hist. Soc.* 48: 11–38.
- Lal, R., Kothari, A., Pande, P. and Singh, S., eds. (1994) *Directory of national parks and sanctuaries in Karnataka*. New Delhi: Centre for Public Policy, Planning and Environmental Studies, Indian Institute of Public Administration.
- Marchetti, K., Price, T. and Richman, A. (1995) Correlates of wing morphology with foraging behaviour and migration distance in the genus *Phylloscopus*. *J. Avian Biol.* 26: 177–181.
- Martens, J. (1980) Lautäußerungen, verwandtschaftliche Beziehungen und Verbreitungsgeschichte asiatischer Laubsänger (*Phylloscopus*). *Fortschritte der Verhaltensforschung* no. 22: 71 pp.
- McClure, H. E. (1984) Survival among the birds of eastern and southeastern Asia. *J. Yamashina Inst. Ornithol.* 16(1):13–62.
- McClure, H. E. and Porntip Leelavit (1972) *Birds banded in Asia during the MAPS Program, by locality, from 1963 through 1971*. Migratory Animal Pathological Survey. Report No. FE-315-7. APO San Francisco: U.S. Army Research and Development Group.
- Neelakantan, K. K., Sashikumar, C. and Venugopalan, R. (1993) *A book of Kerala birds*. Part 1. Trivandrum: World Wide Fund for Nature - India, Kerala State Committee.
- Osmaston, A. E. (1913) The birds of Gorakhpur. *J. Bombay Nat. Hist. Soc.* 22: 532–549.
- Osmaston, B. B. (1923) Bird-life in Gulmarg. *J. Bombay Nat. Hist. Soc.* 29: 493–502.
- Osmaston, B. B. (1926) Birds nesting in the Dras and Suru valleys. *J. Bombay Nat. Hist. Soc.* 31: 186–196.
- Osmaston, B. B. (1927) Notes on the birds of Kashmir. *J. Bombay Nat. Hist. Soc.* 31: 975–999; 32: 134–153.
- Osmaston, B. B. (1930) A tour in further Kashmir. *J. Bombay Nat. Hist. Soc.* 34: 108–134.
- Paludan, K. (1959) On the birds of Afghanistan. *Vidensk. Medd. Dansk Naturh. For.* 122: 1–332.
- Pandey, S., Joshua, J., Rai, N. D., Mohan, D., Rawat, G. S., Sankar, K., Katti, M. V., Khatri, D.V. S. and Johnsingh, A. J. T. (1994) Birds of Rajaji National Park, India. *Forktail* 10: 105–114.
- Parker, S. A. (1970) Review of 'Handbook of the birds of India and Pakistan'. *Emu* 70: 37.
- Price, T. D. (1980) On the occurrence of Tytler's Leaf Warbler, *Phylloscopus tytleri* Brooks in Goa. *J. Bombay Nat. Hist. Soc.* 77: 143–144.
- Price, T. D. (1991) Morphology and ecology of breeding warblers along an altitudinal gradient in Kashmir, India. *J. Anim. Ecol.* 60: 643–664.
- Price, T. D. and Jamdar, N. [1991] (1992) Breeding of eight sympatric species of *Phylloscopus* warblers in Kashmir. *J. Bombay Nat. Hist. Soc.* 88: 242–255.
- Rasmussen, P. C. and Collar, N. J. (in press) A major specimen fraud in the Forest Owllet *Heteroglaux* (*Athene* auct.) *blewitti*. *Ibis*.
- Richman, A. D. and Price, T. D. (1992) Evolution of ecological differences in the Old World leaf warblers. *Nature* 355: 817–821.
- Richmond, C. W. (1895) Birds collected by Dr. W. L. Abbott in Kashmir, Baltistan and Ladak, with notes on some of the species, and a description of a new species of *Cyanecula*. *Proc. U. S. Natn. Mus.* 18: 451–503.
- Ripley, S. D. [1978] (1979) Changes in the bird fauna of a forest area; Simlipal Hills, Mayurbhanj District, and Dhenkanal District, Orissa. *J. Bombay Nat. Hist. Soc.* 75: 570–574.
- Ripley, S. D. (1982) *A synopsis of the birds of India and Pakistan, together with those of Nepal, Bhutan, Bangladesh and Sri Lanka*. Revised ed. Bombay: Bombay Natural History Society and Oxford University Press.
- Roberts, T. J. (1992) *The birds of Pakistan*, 2. Passeriformes: Pittas to buntings. Karachi: Oxford Univ. Press.
- Sharpe, R. B. (1891) *Scientific results of the second Yarkand mission; based upon the collections and notes of the late Ferdinand Stoliczka, Ph.D.—Aves*. London: Taylor and Francis.
- Sibley, C. G. and Monroe Jr., B. L. (1990) *Distribution and taxonomy of birds of the world*. New Haven: Yale University Press.
- Sibley, C. G. and Monroe Jr., B. L. (1993) *A supplement to distribution and taxonomy of birds of the world*. New Haven: Yale University Press.
- Smythies, B. E. (1986) *The birds of Burma*. Third revised edition. Pickering, Ontario: Sylvio Mattachione.
- Stoliczka, F. (1874) Letter to the Editor. *Stray Feathers* 2: 461–463.
- Ticehurst, C. B. (1926) Some notes on the second edition of the Fauna of British India—Birds, vols. I and II. *J. Bombay Nat. Hist. Soc.* 31: 490–499.
- Ticehurst, C. B. (1938) *A systematic review of the genus Phylloscopus (willow-warblers or leaf-warblers)*. London: Trustees of the British Museum.
- Vaurie, C. (1972) *Tibet and its birds*. London: H. F. & G. Witherby.
- Vietinghoff-Scheel, E. V. (1984) *Phylloscopus tytleri* Brooks. Part XII in: E. Stresemann and L. A. Portenko (eds.). *Atlas der Verbreitung Palaearktischer Vögel*. Berlin: Akademie der Wissenschaften der DDR, Akademie Verlag.
- Whistler, H. (1926) The birds of the Kangra district, Punjab. Part 1. *Ibis* (12)2: 521–581.
- Whistler, H. and Kinnear, N. B. (1933) The Vernay Scientific Survey of the Eastern Ghats (ornithological section). Part V. *J. Bombay Nat. Hist. Soc.* 36: 560–590.
- Whistler, H. and Kinnear, N. B. (1935) The Vernay Scientific Survey of the Eastern Ghats (ornithological section). Part XI. *J. Bombay Nat. Hist. Soc.* 38: 26–40.
- Whistler, H. and Ticehurst, C. B. (ms) [Accounts of Indian birds.] Smithsonian Institution Archives, S. Dillon Ripley Papers.
- Whitehead, C. H. T. (1914) Some notes on the birds of the Kaghan Valley, Hazara, North West Frontier Province. *J. Bombay Nat. Hist. Soc.* 23: 104–109.
- Whympers, S. L. (1907) Some notes on birds' nesting in Tehri-Garhwal. *J. Bombay Nat. Hist. Soc.* 17: 817–819.
- Whympers, S. L. (1910) Birds' nesting in Garhwal. *J. Bombay Nat. Hist. Soc.* 19: 990–991.
- Whympers, S. L. (1911) Birds nesting in the Nila Valley (Garhwal). *J. Bombay Nat. Hist. Soc.* 20: 1157–1160.
- Whympers, S. L. (1915) [Exhibition of a number of rare eggs from the higher Himalayas.] *Bull. Brit. Orn. Club* 35: 55–57.
- Williamson, K. (1962) *Identification for ringers. The genus Phylloscopus*. Field Guide No. 8. Oxford: British Trust for Ornithology.
- Zacharias, V. J. and Gaston, A. J. (1993) The birds of Wynaad, southern India. *Forktail* 8: 11–23.